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DECLARATION

FILING OF TRANSLATION OF EUROPEAN PATENT (U.K.) UNDER SECTION 77(6)(a)

I, ALISON WINIFRED PENFOLD, B.A., Dip. (Translation), A.I.T.I., of Lloyd Wise, Tregear & Co., Norman House, 105-109 Strand, London, WC2R OAE, do hereby certify that I am conversant with the English and German languages and am a competent translator thereof and that to the best of my knowledge and belief the following is a true and correct translation made by me into the English language of the granted specification text of European Patent No. 0283651 in the name of ALKOR GMBH KUNSTSTOFFE.

Signed this 25th day of March 1991.

Alison Penfold

The present invention relates to a process for producing coating layers or coating films, in which a painted coating is first applied to a ray-permeable plastic film, is hardened by irradiation and is separated from the plastic release film (reusable plastic film), in which according to the invention a plurality of layers of given composition are applied to produce the printed coating films.

A process for producing a [with] coated backing film hardened by electron beams is already known from EU-A-0 043 063, in which a painted coating which can be hardened by electron beams is applied to a backing film, preferably made of paper, non-woven fabric or textile webs, and a polyester film is laminated on to the painted coating. This laminated material is hardened by irradiation with electron beams and the polyester film is pulled off, so that a hardened painted coating located on a backing (paper, non-woven fabric or textile) remains after the irradiation and the removal of the polyester film. When the polyester film is pulled off there is a risk of damage to the painted coating surface. The backing film used therein is not a release film. Furthermore, there is also no cover layer in this process.

A process for painting flat material such as papers, cardboard, sheet metal and the like with photo-polymerisable coatings is already known from DE-OS 26 19 315, in which a painted coating is applied to the flat material in a layer and is hardened by irradiation with a light source, the painted coating first being applied to a film which is permeable to the hardening light, being brought, with the film, into contact with the flat material surface to be coated, and after the

irradiation through the film and hardening of the painted coating the film is pulled off the coating layer.

What is disadvantageous in this process is that the painted coating is applied in a painting unit and that it must then be squeezed immediately between a pair of rollers with the coating side onto the flat material to be coated.

The coating therefore has to be processed further immediately in the "wet state", so that it is not possible to store the layers. Furthermore, the painted coating cannot additionally be printed in the wet state. Any printing during the squeezing on to the flat material, preferably paper, would change its colours.

This non-transparent or translucent coating layer does not have an additional cover layer nor an intermediate layer arranged on the cover layer, preferably no printed layer, so that the coating layer has to be applied directly to the flat material to be coated without an intermediate layer, cover layer and/or adhesive layer being arranged facing towards the flat material.

The object of the present invention was to avoid the afore-mentioned drawbacks and to devise an improved process and a coating film with improved properties. The layer produced from the liquid coatings should be readily separable from the backing film and be able to be stored temporarily and be able to be applied by means of adhesive or adhesion promoter to different substrates or objects, preferably to wood or timber materials and pieces of furniture made of timber materials.

It was established according to the invention that these objects are met by a process for producing coating layers or coating films and also a coating film itself. According to the process of the invention, at least one cover layer which cannot be heat-sealed and which consists of one or more synthetic resin-containing, plastic-containing, partially polymerised material-containing and/or precondensate-containing layers is applied with a total thickness (measured after hardening or drying) of 2 to 40 µm to a plastic release film (reusable plastic film) at temperatures between 10°C and 90°C, which surface layer contains free reactive chemical groups and colour pigments and/or dyes and has at least one solvent and/or one diluent of more than 35% by weight (relative to the total weight of the cover layer to be applied) and/or liquid (at room temperature) monomers and/or liquid prepolymers, partially polymerised materials or precondensates. A 10 to 95 µm thick, transparent or translucent coating layer having a colour pigment content of less than 3% by weight, preferably without colour pigments, of a painted coating which can be hardened with electron beams is applied over an intermediate layer, preferably a printed layer or colour printed layer, arranged above the cover layer with a total thickness of 0.5 to 12 µm, the coating layer is hardened under the action of the electron beams and the coating film formed on the plastic release film after hardening is pulled off the plastic release film.

According to a preferred embodiment of the process according to the invention, at least one cover layer which cannot be heat-sealed and which consists of one or more synthetic resin-containing, plastic-containing, partially polymerised material-containing and/or

precondensate-containing layers is applied with a t tal thickness (measured after hardening or drying) of 5 to 15 µm onto the plastic release film at temperatures between 20°C and 60°C, which surface layer contains free reactive chemical groups and colour pigments and/or dyes and has at least one solvent and/or one diluent of more than 35% by weight (relative to the total weight of the cover layer to be applied) and/or liquid (at room temperature) monomers and/or liquid prepolymers, partially polymerised materials or precondensates, and a 30 to 50 µm thick, transparent or translucent coating layer with a colour pigment content of less than 3% by weight, preferably without colour pigments, of a painted coating which can be hardened with electron beams is applied over an intermediate layer, preferably a printed layer or colour printed layer, arranged above the cover layer, with a total thickness of 1 to 5 µm, the coating layer is hardened under the action of the electron beams and the coating film formed on the plastic release film after hardening is pulled off the plastic release film.

According to another preferred embodiment of the process according to the invention, first of all as part of the cover layer an adhesive layer 0.1 to 6 µm, preferably 0.5 to 4 µm, thick (measured after hardening or drying) and containing free reactive chemical groups and synthetic resin, plastic and/or liquid (at room temperature) monomers and/or liquid prepolymers, partially polymerised materials and/or precondensates and/or organic-chemical solvents or diluents and thereon one or more colour pigment cover layers having a total thickness of 1.9 to 30 µm, preferably 4.5 to 15 µm, are applied to the release film as another part of the cover layer.

The action of electron beams preferably takes place through the plastic release layer (i.e. from the opposite side of the coating layer). The layers should therefore preferably not contain any metal layers or metal coatings.

According to a preferred embodiment of the process according to the invention, the adhesive layer consists of polyisocyanates, preferably polyisocyanate of hexamethylene diisocyanate, and hydroxy-containing and/or amine group-containing resins, precondensates and/or partially polymerised materials in liquid form, preferably hexamethoxymethylmelamine resin, and/or hydroxyl group-containing polyacrylate and/or polymethacrylate and/or vinyl chloride copolymer or contains one or more of these compounds as a main constituent.

The colour pigment layer(s) which is or are applied to the adhesive layer has or have a diluent and/or solvent content, preferably a content of organic-chemical solvents, of 40 to 70% by weight, preferably 50 to 66% by weight, and a solids content, consisting of colour pigments and/or dyes and synthetic resin binding agents, and also optionally processing aids, of 60 to 30% by weight, preferably 50 to 34% by weight. More than 30% by weight, preferably more than 50% by weight, (relative to diluent or solvent containing 100% by weight) of the diluent or solvent is removed after application by the action of heat, preferably before another layer is applied thereover.

According to a preferred embodiment of the process according to the invention, the colour pigment cover layer(s) which is or are applied to the adhesive layer

consist(s) of liquid monomers, precondensates and/or liquid prep lymers, preferably a mixture of liquid monomers with liquid prepolymers, with a low solvent content and/or diluent content, preferably without solvent and diluent, with a total weight of 90 to 30% by weight, preferably 80 to 50% by weight, and colour pigments and/or dyes, and also optionally processing aids in quantities of weight of 10 to 70% by weight, preferably 20 to 50% by weight.

According to another preferred embodiment, the colour pigment cover layer or colour pigment cover layers consist(s) of 10 to 70% by weight, preferably 20 to 50% by weight, colour pigments and/or dyes and 90 to 30% by weight, preferably 80 to 50% by weight, synthetic resin binding agents or their starting constituents in the form of the monomers, precondensates and/or prepolymers (calculated as solids), relative to the total solids content of the colour pigment cover layer(s).

According to a preferred embodiment of the process, the wet coating layer is hardened via a smooth roller or a textured roller, preferably delustred textured roller, with the texture and/or the delustring being taken over by the coating layer.

The plastic release film or web consists of or contains preferably fluoropolymers, polyolefin, polybutylene terephthalate and/or polyethylene terephthalate, etc., preferably polyvinylidine fluoride, polytetrafluoro-ethylene and/or polyethylene.

The synthetic resin binding agent of the colour pigment cover layer preferably consists of vinyl chloride copolymers, vinyl chloride-acrylate copolymers,

nitrocellulose with maleinate or ketone resin, nitrocellulose with acrylate resins and/or methacrylate resins, preferably acrylate resin.

The transparent or translucent coating layer consists of or contains as plastic binding agent cationically hardening resins, preferably epoxy resins, vinyl ethers and/or vinyl ester polymers, vinyl ester copolymers and/or monomers, prepolymers, precondensates which harden radically to form resins, preferably monomers or prepolymers of acrylates and/or methacrylates, or mixtures of two or more resins with each other or mixtures with one or more of these resins.

The irradiation may take place in the presence of very varied gases for cationically hardenable resins, preferably air or oxygen. Irradiation with special use of an inert gas or an inert atmosphere is not necessary, and is preferably avoided. Likewise, the action of the radiation does not need to take place with alternately differing gas compositions. With the radically hardenable resins, hardening takes place by irradiation, preferably with the use or with the joint use of inert gases, preferably in a nitrogen atmosphere.

The radiation is beta rays or electron beams which from the radiation source are accelerated in an electron accelerator and preferably passed to the substrate via linear and/or plate-shaped cathodes. The accelerating voltage is 150 - 500 KV, preferably 200 - 300 KV.

The invention also relates to printed films, consisting of a plurality of plastic-containing or synthetic resin-containing layers, the film being a coating film which is composed of at least one cover layer which cannot be

heat-sealed consisting of one or more synthetic resin-containing or plastic-containing layers and having a total thickness (measured after hard ning or drying) of 2 to 40 µm, preferably 5 to 15 µm, which contains free reactive chemical groups and colour pigments and/or dyes, of a printed layer, preferably colour printed layer, arranged above the cover layer with a total thickness of 0.5 to 12 µm, preferably 1.0 to 5 µm, (measured after hardening or drying) and a transparent or translucent coating layer 10 to 95 µm, preferably 30 to 50 µm, thick arranged thereover with a colour pigment content of less than 3% by weight, preferably without colour pigments, consisting of or containing a painted coating hardened with electron beams, preferably hardened with beta rays.

As the lower layer, as a constituent of the cover layer, according to a preferred embodiment, the printed film contains an adhesive layer 0.1 to 6 µm, preferably 0.5 to 4 µm, thick (measured after hardening or drying) which contains free chemical reactive groups and synthetic resin or plastic. One or more colour pigment cover layers having a total thickness of 1.9 to 30 µm, preferably 4.5 to 15 µm, are arranged thereon as another part of the cover layer.

According to a preferred embodiment, the colour pigment cover layer or colour pigment cover layers consist(s) of 10 to 70% by weight, preferably 20 to 50% by weight, colour pigments and/or dyes and 90 to 30% by weight, preferably 80 to 50% by weight, synthetic resin binding agents (calculated as solids) relative to the total solids content of the colour pigment cover layer(s).

The invention further relates to an apparatus

combination for producing coated film webs, with the aid of which the painted coating is first applied to a ray-permeable plastic film or plastic film web and is hardened by an irradiation device and is separated from the plastic film or plastic film web (plastic release film). The apparatus combination consists of an unwinding device for the plastic release film or film web, at least one subsequent pair of printing rollers or printing unit for applying an adhesive layer, at least one subsequent pair of printing rollers or printing roller unit for applying the cover layer, at least one, preferably several, subsequent pairs of printing rollers or printing roller units for applying at least one printed layer, at least one subsequent coating machine for applying a transparent or translucent coating layer, at least one subsequent electron gun or an electron beam device, at least one winding device for the release film and at least one winding device for the finished coated film or coated film web.

Description of the Figures:

Embodiments of the invention are illustrated schematically in the appended Figures 1 and 2.

Figure 1 shows a cross-section through the coating layer located on a release film (1). The plastic release film (1) is joined to the adhesive layer (2) and the latter to the cover layer (3). On the cover layer there are one or more printed layers (4) which are covered by the transparent or translucent coating layer (5).

Figure 2 illustrates schematically the apparatus or apparatus combination according to the invention.

The plastic release film (1) passes from th unwinding device (6) for the releas film to the printing unit or pair of printing rollers (7) which serves to apply the adhesive layer (2), and then to the printing unit or pair of printing rollers (9) for applying the cover layer (3) to the release film (1) which is provided with the adhesive layer (2).

For applying printed layers (4), in particular multi-colour printed layers, preferably a plurality of printing units or pairs of printing rollers (9 to 12) are arranged, with the aid of which the printed layer or printed layers are applied to the cover layer. The plastic film or plastic film web thus coated and printed then passes to the electron gun(s) or the electron irradiation apparatus (13), is separated after irradiation in such a manner that the release film (1) passes to the winding device (15) for the release film or to the station (6 or 7), whereas the coating film which has been separated from the release film is taken up by the winding device (16) or is cut into film webs of given length.

Example of embodiment:

Layers of the following composition were applied to a plastic release film, preferably a polyolefin film, at temperatures between 20 and 80°C and were separated from the release film as a coating layer:

Adhesive layer (mixture or alloy of)	Methyl ethyl ketone	360 parts by wt.
	Methyl isobutyl ketone	360 parts by wt.
	Polyisocyanate	40 parts by wt.
	Hexamethoxymethyl-melamine	40 parts by wt.
	Polyvinyl chloride copolymer containing hydroxyl groups	200 parts by wt.
Cover layer (mixture or alloy of)	Methyl ethyl ketone	300 parts by wt.
	Methyl isobutyl ketone	250 parts by wt.
	Pigments	300 parts by wt.
	Acrylate resin containing hydroxyl groups	150 parts by wt.
Printed layer (mixture or alloy of)	Methyl ethyl ketone	360 parts by wt.
	Methyl isobutyl ketone	360 parts by wt.
	Pigments	80 parts by wt.
	Acrylate resin	200 parts by wt.
Coating layer A (mixture or alloy of)	Reactive diluent (preferably low-viscose monomeric acrylates)	3600 parts by wt.
	Aliphatic epoxy-diacrylate	1600 parts by wt.
	Polyester acrylate	3600 parts by wt.
Coating layer B (mixture or alloy of)	Reactive diluent (preferably low-viscose monomeric acrylates)	3600 parts by wt.
	Oligoester acrylate	2000 parts by wt.
	Urethane acrylate	3200 parts by wt.

Coating layer C (mixtur or alloy of)	Reactive diluent (preferably low-viscose monomeric acrylates)	3200 parts by wt.
	epoxidised soya bean oil acrylate	3200 parts by wt.
	Polyester acrylate	2000 parts by wt.
		3600 parts by wt.
Coating layer D (mixture or alloy of)	Reactive diluent (preferably low-viscose monomeric acrylates)	3000 parts by wt.
	Aliphatic epoxy-diacrylate	3000 parts by wt.
	Polyester acrylate containing hydroxyl groups	2000 parts by wt.
	Polyisocyanate	3200 parts by wt.
		450 parts by wt.

Claims

1. Process for producing coating layers or coating films, in which at least one cover layer which cannot be heat-sealed and which consists of one or more synthetic resin-containing, plastic-containing, partially polymerised material-containing and/or precondensate-containing layers is applied with a total thickness (measured after hardening or drying) of

2 to 40 µm

to a plastic release film (reusable plastic film) at temperatures between

10°C and 90°C,

which surface layer contains free reactive chemical groups and colour pigments and/or dyes and has at least one solvent and/or one diluent of more than 35% by weight (relative to the total weight of the cover layer to be applied) and/or liquid (at room temperature) monomers and/or liquid prepolymers, partially polymerised materials or precondensates and a

10 to 95 µm

thick, transparent or translucent coating layer having a colour pigment content of less than 3% by weight, preferably without colour pigments, of a painted coating which can be hardened with electron beams is applied over an intermediate layer, preferably a printed layer or colour printed layer, arranged above the cover layer with a total thickness of

0.5 to 12 µm

and the coating layer is hardened under the action of the electron beams and the coating film formed on the plastic release film after hardening is pulled off the plastic release film.

2. Process according to Claim 1, characterised in that at least one cover layer which cannot be heat-sealed and which consists of one or more synthetic resin-containing, plastic-containing, partially polymerised material-containing and/or precondensate-containing layers is applied with a total thickness (measured after hardening or drying) of

5 to 15 µm

onto a plastic release film (reusable plastic film) at temperatures between

20°C and 60°C,

which surface layer contains free reactive chemical groups and colour pigments and/or dyes and has at least one solvent and/or one diluent of more than 35% by weight (relative to the total weight of the cover layer to be applied) and/or liquid (at room temperature) monomers and/or liquid prepolymers, partially polymerised materials or precondensates, and a

30 to 50 µm

thick, transparent or translucent coating layer with a colour pigment content of less than 3% by weight,

preferably without colour pigments, of a painted coating which can be hardened with electron beams is applied over an intermediate layer, preferably a printed layer or colour printed layer, arranged above the cover layer, with a total thickness of

1 to 5 µm

and the coating layer is hardened under the action of the electron beams and the coating film formed on the plastic release film after hardening is pulled off the plastic release film.

3. Process according to Claims 1 and 2, characterised in that first of all as part of the cover layer an adhesive layer

0.1 to 6 µm, preferably
0.5 to 4 µm,

thick (measured after hardening or drying) and containing free reactive chemical groups and synthetic resin, plastic and/or liquid (at room temperature) monomers and/or liquid prepolymers, partially polymerised materials and/or precondensates and/or organic-chemical solvents or diluents and thereon one or more colour pigment cover layers having a total thickness of

1.9 to 30 µm, preferably
4.5 to 15 µm,

are applied to the release film as another part of the cover layer.

4. Process according to one or more of Claims 1 to 3, characterised in that th action of electron beams takes place through th plastic release layer (hence from the opposite side of the coating layer).

5. Process according to one or more of Claims 1 to 4, characterised in that the adhesive layer consists of polyisocyanates, preferably the polyisocyanate of hexamethylene diisocyanate, and hydroxy-containing and/or amine group-containing resins, precondensates and/or partially polymerised materials in liquid form, preferably hexamethoxymethylmelamine resin, and/or hydroxyl group-containing polyacrylate and/or polymethacrylate and/or vinyl chloride copolymer or contains one or more of these compounds as a main constituent.

6. Process according to one or more of Claims 1 to 5, characterised in that the colour pigment cover layer(s) which is or are applied to the adhesive layer has or have a diluent and/or solvent content, preferably a content of organic-chemical solvents, of

40 to 70% by weight, preferably
50 to 66% by weight,

and a solids content, consisting of colour pigments and/or dyes and synthetic resin binding agents, and also optionally processing aids, of

60 to 30% by weight, preferably
50 to 34% by weight,

and

mor than 30% by weight, preferably
more than 50% by weight,

(relative to diluent or solvent containing 100% by weight) of the diluent or solvent is removed after application by the action of heat before another layer is applied thereover.

7. Process according to one or more of Claims 1 to 6, characterised in that the colour pigment cover layer(s) which is or are applied to the adhesive layer consist(s) of liquid monomers, precondensates and/or liquid prepolymers, preferably a mixture of liquid monomers with liquid prepolymers, with a low solvent content and/or diluent content, preferably without solvent and diluent, with a total weight of

90 to 30% by weight, preferably
80 to 50% by weight,

and colour pigments and/or dyes, and also optionally processing aids in quantities of weight of

10 to 70% by weight, preferably
20 to 50% by weight.

8. Process according to one or more of Claims 1 to 7, characterised in that the colour pigment cover layer or colour pigment cover layers consist(s) of

10 to 70% by weight, preferably
20 to 50% by weight,

colour pigments and/or dyes and

90 to 30% by weight, preferably
80 to 50% by weight,

synthetic resin binding agents or their starting constituents in the form of the monomers, precondensates and/or prepolymers (calculated as solids), relative to the total solids content of the colour pigment cover layer(s).

9. Process according to one or more of Claims 1 to 8, characterised in that the wet coating layer is hardened via a smooth roller or a textured roller, preferably delustred textured roller.

10. Printed films, consisting of a plurality of plastic-containing or synthetic resin-containing layers, which are composed of at least one cover layer which cannot be heat-sealed consisting of one or more synthetic resin-containing or plastic-containing layers and having a total thickness (measured after hardening or drying) of

2 to 40 µm, preferably
5 to 15 µm,

which contains free reactive chemical groups and colour pigments and/or dyes, of a printed layer, preferably colour printed layer, arranged above the cover layer with a total thickness of

0.5 to 12 µm, preferably
1.0 to 5 µm,

(measured after hardening or drying) and a transparent or translucent coating layer

10 to 95 µm, pr ferably
30 to 50 µm,

thick arranged thereover with a colour pigment content of less than 3% by weight, preferably without colour pigments, or containing a painted coating hardened with electron beams, preferably hardened with beta rays.

11. Printed films according to Claim 10, characterised in that an adhesive layer

0.1 to 6 µm, preferably
0.5 to 4 µm,

thick (measured after hardening or drying) which contains free chemical reactive groups and synthetic resin or plastic as the lower layer of the cover layer and one or more colour pigment cover layers having a total thickness of

1.9 to 30 µm, preferably
4.5 to 15 µm,

are arranged thereon as another part of the cover layer.

12. Printed films according to Claims 10 and 11, characterised in that the colour pigment cover layer or colour pigment cover layers consist(s) of

10 to 70% by weight, preferably
20 to 50% by weight,

colour pigments and/or dyes and

90 to 30% by weight, preferably
80 to 50% by weight,

synthetic resin binding agents (calculated as solids) relative to the total solids content of the colour pigment cover layer(s).

13. Apparatus combination for producing coated film webs, consisting of a combination of an unwinding device for the plastic release film or film web, at least one subsequent pair of printing rollers or printing unit for applying an adhesive layer, at least one subsequent pair of printing rollers or printing roller unit for applying the cover layer, at least one, preferably several, subsequent pairs of printing rollers or printing roller units for applying at least one printed layer, at least one subsequent coating machine for applying a transparent or translucent coating layer, at least one subsequent electron gun or an electron beam device, at least one winding device for the release film and at least one winding device for the finished coated film or coated film web.

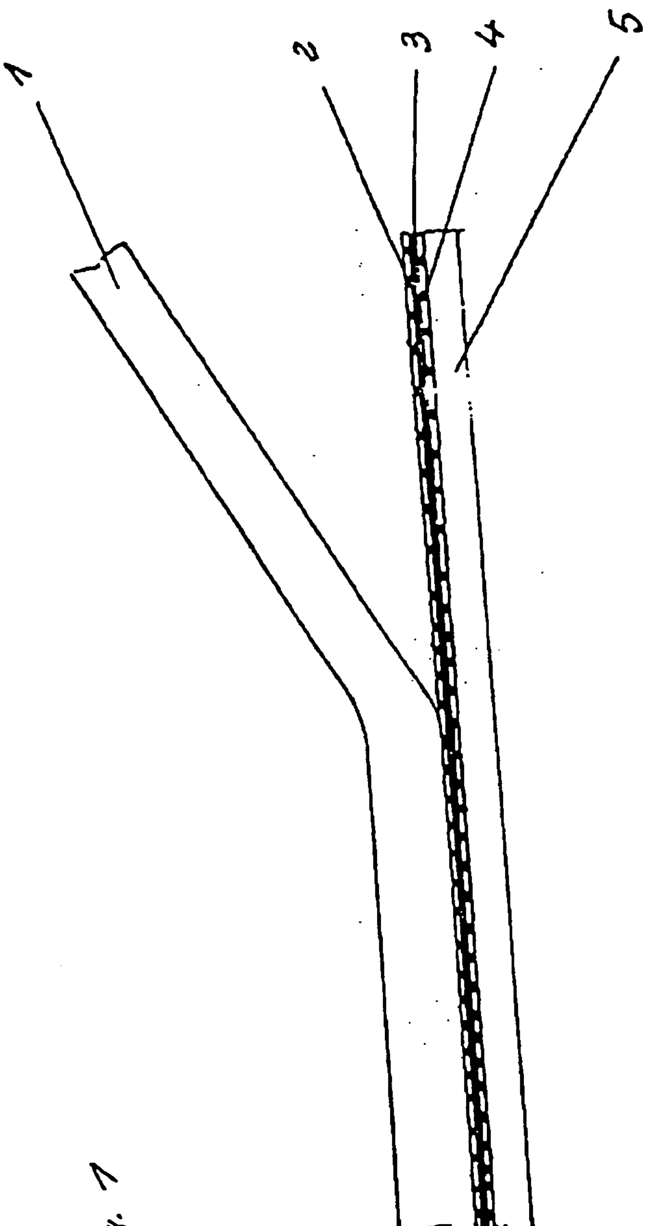

Fig. 1

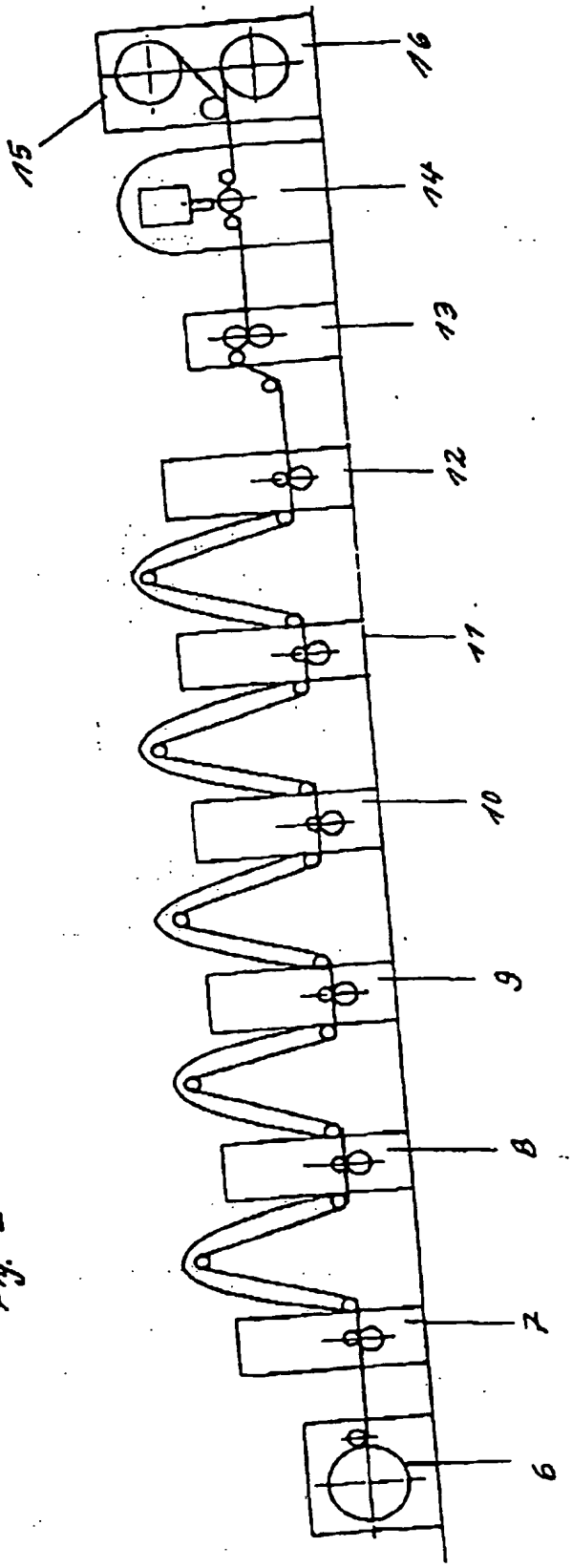

Fig. 2